

116

FIBRE CHANNEL TESTING FOR STORAGE AREA NETWORKS

APPLICATION NOTE

Raffi Tchakmakjian, Product Manager

Industry

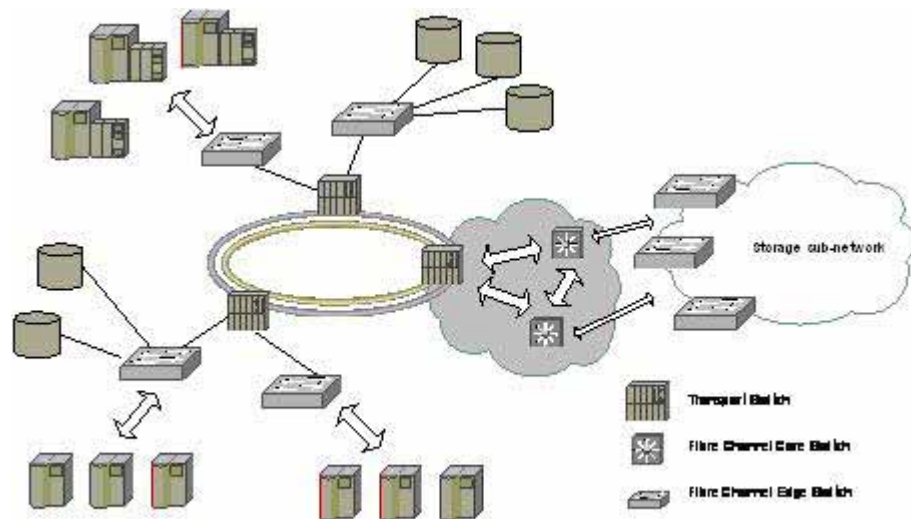
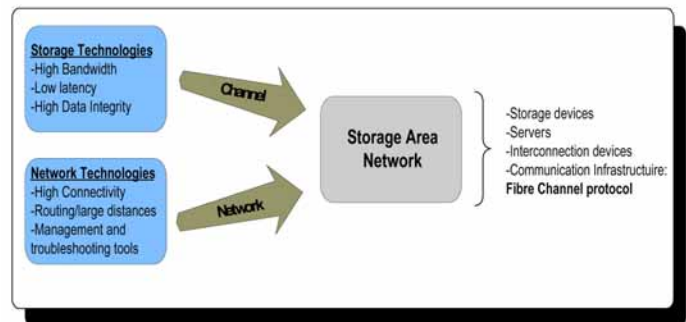
In today's data-driven world, information storage is a vital element of IT infrastructures. With an increase in software applications, e-business technologies and computing power, there is an exponential growth in enterprise data generation. This growth is causing a paradigm shift in storage solutions. In order to implement systems for disaster recovery, archiving, backup and data warehousing, traditional channel-based storage technologies just won't do. Although they provide low latency, high bandwidth and data integrity, they lack network-based connectivity elements such as long-distance data transfers and uniform management/troubleshooting platforms.

Fibre Channel and Storage Area Networks

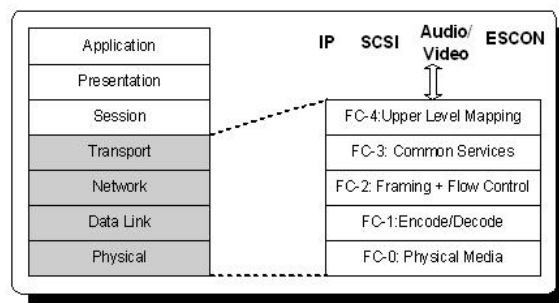
The concept of storage area networks (SAN) was created in order to integrate storage and network technologies for storage solutions, in response to today's enterprise needs.

A SAN is a grouping of interconnected devices and servers using a common communication infrastructure, which capitalizes on the best of both the storage and network worlds. The *de facto* protocol for this infrastructure is Fibre Channel, an ANSI standard, that allows for an inexpensive and scalable architecture providing fast and reliable data transfers over long distances.

The most common topology deployment of Fibre Channel is a switched network, called a fabric, where switches provide the necessary hardware for switching and routing. Most of today's Fibre Channel networks run on fiber-optic cables at rates of 1 Gb/s and 2 Gb/s, with future deployments aiming for 4 Gb/s and 10 Gb/s.



To ensure channelled and networked services, the Fibre Channel architecture has been split into five logical layers, with the concept of a login action at FC-2 that allows for node-to-node parameter negotiation and access for data exchange. One can roughly think of the five logical layers as the equivalent of the OSI model up through the transport layer. FC-0, FC-1 and FC-2 are responsible for the actual link initialization, switching and transfer of the data, whereas layers 3 and 4 provide addressing and mapping services for protocols such as IP or SCSI. Fibre Channel also offers multiple classes of service such as dedicated connections, multiplexed frames and connectionless traffic.



Fibre Channel Deployment and Testing with EXFO's FTB-8520

Fibre Channel deployment methodologies are tightly coupled to the network design. For fabric-based topologies, the key areas to concentrate on are the following:

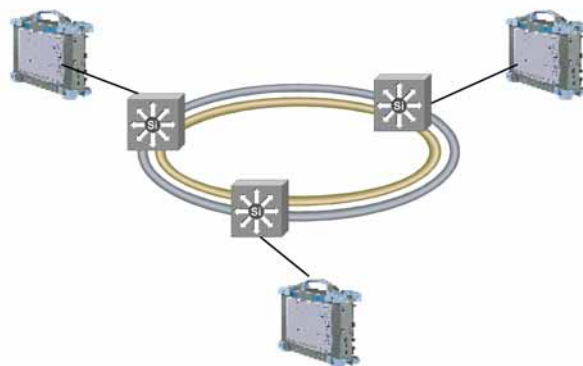
- Transport networks
- Fibre Channel interconnection devices
- Fibre Channel end nodes
- Global end-to-end network

Since most SANs cover large distances and Fibre Channel has stringent performance attributes that must be respected, it is imperative to test at each phase of network deployment to ensure appropriate service levels. EXFO's FTB-8520 Packet Blazer SAN module is the industry's first truly portable test instrument capable of testing 1 Gb/s and 2 Gb/s Fibre Channel network deployments. It offers full wire-speed traffic generation at FC-0, FC-1 and FC-2 logical layers, and bit-error-rate testing (BER) for link integrity measurements, as well as features like latency and buffer-to-buffer credit measurements for optimization, and full login capabilities which enable end-to-end Fibre Channel network testing.

Transport Networks

The transport networks are the pipes that carry Fibre Channel traffic. Most Fibre Channel deployments are piggy-backed on metro networks (SAN extensions), such as DWDM or SONET/SDH. These networks have to be qualified error-free in order to guarantee the latency and data accuracy required by the Fibre Channel protocol. In order to do this, field technicians can use the FTB-8520 to do round-trip latency measurements with unframed or framed traffic, as well as BER testing, specifically at the FC-0 logical layer (unframed) with user-defined or PRBS patterns. The FTB-8520 can also be used to simulate customer traffic by generating traffic up to the FC-2 level, with Primitive Sequence Protocol (PSP) and by enabling flow-control management. In parallel to these testing capabilities, the FTB-8520 also offers key usability features to facilitate the procedure and reduce testing time:

- Real-time and historical reporting
- Scripting, which allows for test automation
- Configuration saving and loading

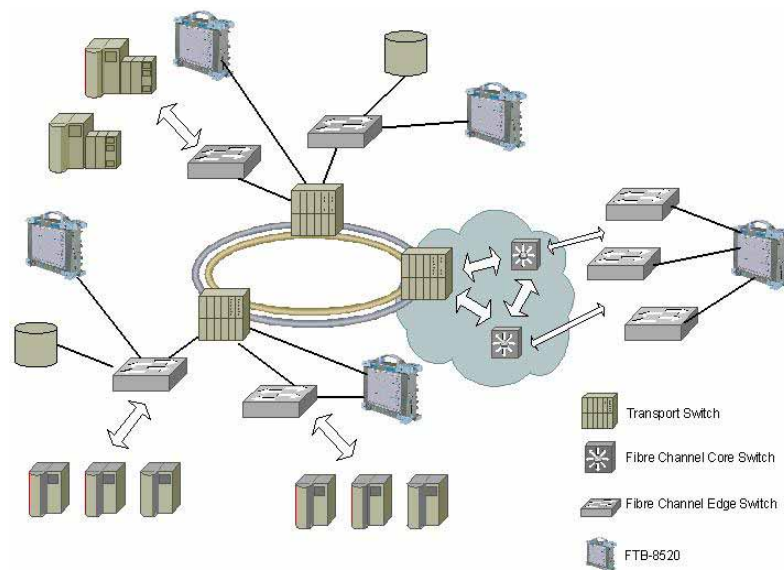


FC Interconnection Devices and End Nodes

Once the transport network qualified, the next step is to install the Fibre Channel interconnection devices and connect them to the end nodes. The interconnection devices consist of the core and access switches; i.e., the elements that make up the fabric. The end nodes are usually server farms, backup clusters, databases, etc., which are attached to the fabric via system controllers and the host bus adapters. The FTB-8520 can help test and configure interconnection devices with the following features:

- Fabric login: This feature allows for the exchanging of service parameters with a fabric switch and ultimately allows access to the fabric in order to reach the targeted node.
- Buffer-to-Buffer Credit estimation: BB_Credit measurement allows for flow control management by estimating the amount of memory buffers required to be configured at each node for optimal operation of the network.
- Round-trip latency tests: This test helps determine the lag introduced by the presence of the interconnection device.
- Data integrity with FC-1/FC-2 framed BER testing: This feature evaluates frequency fluctuations, transceiver noise and phase jumps caused by jitter with different types of patterns such as CRPAT, CSPAT, CJPAT and PRBS.
- Frame configuration and traffic generation: Frame configuration and traffic generation allows for the simulation of end-user traffic that will flow through the interconnection devices.

The FTB-8520 also offers the possibility of testing end nodes with the same features as those used for interconnection devices, as well as the ability to do a Port login, which is the equivalent of a fabric login for an end node.



Global End-to-End Network

With the test features of the Packet Blazer SAN FTB-8520, it is possible to qualify and optimize an end-to-end Fibre Channel network as a whole, at all levels, including the interconnection devices and the transport network. Coupled with its easy-to-use and efficient interface, the FTB-8520 is the premium test solution in the industry for Fibre Channel network deployments.

Corporate Headquarters > 400 Godin Avenue, Vanier (Quebec) G1M 2K2 CANADA | Tel.: 1 418 683.0211 | Fax: 1 418 683.2170 | info@exfo.com

Toll-free: 1 800 663.3936 (USA and Canada) | www.exfo.com

EXFO America	4275 Kellway Circle, Suite 122	Addison, TX 75001 USA	Tel.: 1 800 663.3936	Fax: 1 972 836.0164
EXFO Europe	Le Dynasteur, 10/12 rue Andras Beck	92366 Meudon la Forêt Cedex FRANCE	Tel.: +33.1.40.83.85.85	Fax: +33.1.40.83.04.42
EXFO Asia-Pacific	151 Chin Swee Road, #03-29 Manhattan House	SINGAPORE 169876	Tel.: +65 6333 8241	Fax: +65 6333 8242
EXFO China	Beijing New Century Hotel Office Tower, Room 1754-1755 No. 6 Southem Capital Gym Road	Beijing 100044 P. R. CHINA	Tel.: +86 (10) 6849 2738	Fax: +86 (10) 6849 2662